RUST GEOTECH INC.

Spectral Gamma-Ray Borehole
Log Data Report



**Borehole** 51-06-10

**Log Event** A

## Borehole Information

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|---|---|---|
| **Farm :** TX | **Tank :** TX-106 | **Site Number :** 299-W15-147 |
| **N-Coord :** 41,785 | **W-Coord :** 75,885 | **TOC Elevation :** 671.91 |
| **Water Level, ft :** | **Date Drilled :** 7/31/1971 | |

**Casing Record**

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|---|---|---|
| Type : Steel-welded | Thickness, in. : 0.280 | ID, in. : 6 |
| Top Depth, ft. : 0 | Bottom Depth, ft. : 100 | |

**Borehole Notes:**

The drilling of this borehole was initiated in July 1971 with a 13-ft length of starter casing of unknown diameter. The borehole was completed to a depth of 100 ft using 6-in. casing. The drilling log does not indicate that the casing was perforated or that any interval of the borehole was grouted. The drilling log reports encountering cement from 43 to 44 ft, which is most likely the top of the concrete footing that surrounds the base of the tank. The drilling log also reports a zone of rotten wood between 44 and 47 ft, which is probably the remnant of construction debris near the base of the tank.

The casing thickness is presumed to be 0.280 in., on the basis of published thickness for schedule-40, 6-in. steel tubing.

The zero reference for the SGLS logs is the top of the borehole casing. The top of the casing is flush with the ground surface.

## Equipment Information

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|---|---|---|
| **Logging System :** 1 | **Detector Type :** HPGe | **Detector Efficiency:** 35.0 % |
| **Calibration Date :** 11/1995 | **Calibration Reference :** GJPO-HAN-3 | **Logging Procedure :** P-GJPO-1783 |

## Log Run Information

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|---|---|---|---|---|---|
| **Log Run Number :** | 1 | **Log Run Date :** | 1/26/1996 | **Logging Engineer:** | Bob Spatz |
| **Start Depth, ft.:** | 0.0 | **Counting Time, sec.:** | 100 | **L/R :** L | **Shield :** N |
| **Finish Depth, ft. :** | 19.5 | **MSA Interval, ft. :** | 0.5 | **Log Speed, ft/min.:** | n/a |

| | | | | | |
|---|---|---|---|---|---|
| **Log Run Number :** | 2 | **Log Run Date :** | 1/29/1996 | **Logging Engineer:** | Bob Spatz |
| **Start Depth, ft.:** | 98.0 | **Counting Time, sec.:** | 100 | **L/R :** L | **Shield :** N |
| **Finish Depth, ft. :** | 30.5 | **MSA Interval, ft. :** | 0.5 | **Log Speed, ft/min.:** | n/a |

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|---|---|---|---|---|---|
| **Log Run Number :** | 3 | **Log Run Date :** | 1/30/1996 | **Logging Engineer:** | Bob Spatz |
| **Start Depth, ft.:** | 18.5 | **Counting Time, sec.:** | 100 | **L/R :** L | **Shield :** N |
| **Finish Depth, ft. :** | 31.5 | **MSA Interval, ft. :** | 0.5 | **Log Speed, ft/min.:** | n/a |

## Analysis Information

Analyst : H.D. Mac Lean

Data Processing Reference : P-GJPO-1787 Analysis Date : 12/4/1996

**Analysis Notes :**

This borehole was logged by the SGLS in three logging runs. The pre- survey field verification spectra for all three logging runs failed to meet the acceptance criteria established for the peak shape and system efficiency. A nonconformance report issued in August 1996 (N-96-05) identified the cause of this failure as a power supply malfunction that resulted in a low detector bias voltage being supplied to the logging tool. This malfunction occurred in the mornings because of inadequate system warm-up time. The nonconformance report also documents that radionuclide concentrations calculated from data collected in the first 2 hours of logging operation could be systematically understated by about 10 percent. Data from logging runs one and two are probably unaffected, but data from depths between approximately 20 to 30 ft collected during the early part of logging run three may show a repeatability problem if the borehole is re-logged in the future.

The post-survey field verification spectra for all the logging runs passed the acceptance criteria for the peak shape and system efficiency, indicating that the logging system was operating within specification after an initial warm-up period. The energy calibration and peak-shape calibration from the post-survey field verification spectra were used to establish the channel-to-energy parameters used in processing the spectra acquired during logging. There was no gain drift during the logging activity. It was not necessary to adjust the energy calibration to maintain proper peak identification while processing the data from the logging spectra. Casing correction factors for a 0.280-in.-thick steel casing were applied during analysis.

Depth overlaps, where data were collected by separate runs at the same depth, occurred in this borehole between depths of 18.5 and 19.5 ft and between depths of 30.5 and 31.5 ft. The KUT and Cs-137 concentrations were calculated using the separate data sets at the overlapping depth points. The calculated concentrations using the separate data sets were within the statistical uncertainty of the measurements, indicating very good repeatability of results from the logging activity.

Cs-137 was the only man-made gamma-ray-emitting radionuclide encountered in this borehole. Cs-137 contamination was detected continuously from the ground surface to a depth of 4.5 ft and between depths of 14.5 and 18.5 ft. Detectable quantities of less than 0.2 pCi/g were also encountered between 9.5 and 13.5 ft, at 19.5, 20, 25, 27, 97.5, and 98 ft. The highest measured Cs-137 concentration was about 5 pCi/g at the ground surface.

The logs of the naturally occurring radionuclides shows a pronounced increase in the K-40 concentrations and a slight increase in the Th-232 concentrations at a depth of about 48 ft.

The SGLS total count log plot reflects the log plots of the Cs-137 concentration where present and the concentration of the naturally occurring radionuclides elsewehere. There is a pronounced increase in the

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SGLS total count rate below a depth of about 47 ft. There is a decrease in the count rate between depths of 86 and 95 ft.

Details regarding the interpretation of the data for this borehole are presented in the Tank Summary Data Report for tank TX-106.

**Log Plot Notes:**

Separate log plots show the man-made (Cs-137) and the naturally occurring (KUT) radionuclides. The natural radionuclides can be used for lithology interpretations. The headings of the plots identify the specific gamma rays used to calculate the concentrations.

Uncertainty bars on the plots show the statistical uncertainties for the measurements as 95-percent confidence intervals. Open circles on the plots give the MDL. The MDL of a radionuclide represents the lowest concentration at which positive identification of a gamma-ray peak is statistically defensible.

A combination plot includes both the man-made and natural radionuclides, in addition to the total gamma derived from the spectral data and the Tank Farm gross gamma log. The gross gamma plot displays the latest available digital data. No attempt has been made to adjust the depths of the gross gamma logs to coincide with the SGLS data.